REMARKS

Claim 28 has been amended. Claims 28-47 are presently pending, of which claims 39-47 have been withdrawn from consideration.

The Examiner is thanked for the courtesies extended in the interview conducted on May 25, 2007.

In view of such amendments and the following remarks, reconsideration and allowance of the claims, as presently presented, are respectfully requested.

EXAMINER'S ACTION

The 35 U.S.C. § 112 Rejections

Claims 28-38 were rejected under 35 U.S.C. § 112, first paragraph ("Section 112"), as containing subject matter not described in the original disclosure, based on the recitation of the limitation "film being substantially liquid" in claim 28.

As discussed with the Examiner during the interview, claim 28 has been amended to recite that the film is "nearly" liquid, which is supported in the specification at page 18, ln. 15-17 and page 35, ln. 18-20. Accordingly, the rejection under Section 112 has been overcome and should be withdrawn.

The 35 U.S.C. § 103 Rejections

Claims 28-38 stand rejected as being obvious over Craven in view of *Polymer Science*.

The Examiner interview included a discussion of structural features required by the article (rubber tire) of claim 28 that would distinguish claim 28 over a rubber tire including the film disclosed in Craven. Claim 28 has been amended, in relevant part, to require that the flexible film with the antislipping agents formed on the tire comprises "modified silicone". As discussed in the specification, the modified silicone in the film

"will cause condensation polymerization action by water in air, rain, etc. to strongly adhere to a wet object." (See specification, page 14, lines 17-20). In addition, claim 28 requires that "the film is chemically bonded to the contact surface through dealcoholization or dehydration". As noted in the specification, the modified silicone in the film is "strongly chemically bonded flexibly" to the contact surface of the tire by evaporation or dissolving of denatured alcohol. (See specification, page 21, lines 6-21 and page 22, lines 13-19).

In contrast to the invention claimed in amended claim 28, Craven does not teach or suggest including modified silicone in the flexible film formed on a contact surface of a tire.

In addition, amended claim 28 requires that the contact surface upon which the inventive film is formed includes "concave regions having respective predetermined sizes", such that the film is also formed in the concave regions of the contact surface. (See specification, page 21, lines 1-15 and page 22, lines 14-18). The penetration of the antislipping agents and the modified silicone of the film into the concave regions, or recesses, of the contact surface advantageously provides that, even if the film on the portions of the contact surface initially contacting the road, or protrusions of the contact surface, were to peel off or wear away based on tire wear, *i.e.,* running of the tire on a road surface such the contact surface is worn by contact with the road surface, the film in the concave regions of the contact surface would continue to provide that the tire has an increased coefficient of static friction, thereby contributing to the longevity of the tire. (See specification, page 18, lines 12-23).

The unexpected results of (i) an increase in the coefficient of static friction for the contact surface of a tire, based on the tire having the film as required by claim 28 on its

contact surface, and (ii) the increase in the coefficient of static friction remaining following an extended period of tire wear, is evidenced by the results of the following experiments performed by the applicant.

Coefficient of static friction testing

A rubber test piece including the film as described in each of examples 1-8 of the specification formed on a contact (tread) surface, and also a rubber test piece without any film, were tested. Each test piece was a 12.7 mm square block having a contact surface with a groove width of 0.8 mm and a groove depth of 5 mm. The characteristics of the films formed on the respective test pieces are summarized in Table A attached to this response.

The testing constituted applying a load of 1.8 kgf to the test piece as the contact surface of each test piece was moved 100 mm/minute over a surface having a para-surface coarseness of P80. The coefficient of static friction on the contact surface for each test piece was measured immediately after application of the film to the contact surface, and after 70% and 100% of the test piece had been worn off (abraded).

Table B attached to this response shows the results obtained from the experimentation. Referring to Table B, for the test pieces including the film as described in examples 1-6 of the specification, the coefficient of static friction of the test piece where 70% of the test piece had been worn off was identical to or almost as high as the coefficient of static friction immediately after the film had been applied to the contact surface. In other words, the increased coefficient of static friction of the film of claim 28, which is an energy consumption improving agent, on the contact surface of the test piece did not change following substantial wear of the test piece, such that the inventive film contributed to the durability of the test piece. As to the test piece including

the film of example 2, the addition of inorganic materials increased the initial coefficient of static friction, although some inorganic materials detached from the test piece where 100% of the rubber test piece has been abraded.

In addition, the experimental results for the test pieces including the films of examples 7 and 8 of the specification show that modified polyurethane and modified chloroprene rubber having a large molecular weight have a low durability for abrasion. This result occurred because modified polyurethane and modified chloroprene rubber do not have reactive groups to provide that they physically adhere to the tread surface of a tire. In contrast, the inventive film, which was formed on each of the test pieces for the examples 1-6 of the specification, penetrated the contact surface. The modified silicone in the inventive film includes a reactive amino group or alkoxy group, and such group is bound to a hydroxyl group existing on the contact surface of the tire, such as through dealcoholization or dehydration, thereby providing that "the film is chemically bonded to the contact surface" as required by claim 28. Thus, even if the film applied to the contract surface of the tire is peeled from the protrusions of the contact surface, the film portions in the concave regions of the contact surface, for example, disposed between the edge of the groove and the grounding portion of the contact tread surface, contribute to maintaining the increase in the coefficient of static friction.

Based on the experimentation, it is expected that the contract surface of a conventional tire including the inventive film needs to be run at least 1000 km over a road surface for 70% of the contact surface of the tire to be worn away. In contrast, according to Craven, a Craven film formed on the tread surface of a tire would remain on the tire for only 8-16 km (5-10 miles) of running wear. It is not likely that a tire with the Craven film experiencing 1000 km or more of running wear would maintain the

same coefficient of static friction, such that the tire with the Craven film would not have as long as a wear lifetime as a tire including the inventive film on its tread surface.

Hysteresis loss test

In another experiment, 5×2×20-30 mm test pieces were obtained from the tread portion of a same tire. The film of example 1 of the specification was applied to a contact surface of one test piece, and another test piece did not have any film applied thereto. A viscoelasticity spectrometer (Temperature control: -40℃ to 80℃, Vibration: 20 Hz) was used to measure hysteresis losses at 0℃ and 60℃.

It was found that there was no difference in the hysteresis loss between the test piece including the inventive film and the one without any film. As rolling resistance of a tire = hysteresis loss + friction resistance, it is evident that the rolling resistance of a tire does not depend on the elastic characteristics of the inventive film. In contrast, based on the teachings of Craven, the application of the Craven film to a tire decreases hysteresis loss.

Braking distance test

The film of example 1 of the specification was applied to the contact (tread) surface of a Dunlop economy 165/80R13 tire (tire (A)). The braking distances of the tire (A) and of a same Dunlop economy 165/80R13 tire as the tire (A), except without any film thereon (tire (B)), were measured after running the tires at a speed of from 49 to 55 km/h on a sprinkling wet road surface having a low coefficient of sliding friction. FIG. A attached to this response shows the results of the braking distance test. Referring to FIG. A, the braking distance for the tire (A) is shorter than that of the tire (B), such that the inventive film of the tire (A) provides improved braking performance on a road having a low coefficient of sliding friction.

In addition, as running a rubber tire over a road surface causes shock to the tread surface, in other words, wear and changes in shape caused by rubber elasticity, it is expected that the Craven film formed on a rubber tire, which film is physically adhered to the tire, is likely to experience peeling when the tire is run over a road surface. In contrast, the film according to the present invention is chemically bound to the contact surface of the rubber tire through dealcoholization or dehydration and, thus, will not peel. Although the film is worn by abrasion of the tread surface, the film is always on the tread surface, thereby maintaining an improved, increased frictional resistance for the tire. In addition, the chemical binding of the film to the tread surface provides that the film elastically follows any change in the tread shape, such that the film remains upon the tread surface in such circumstances and does not peel off the tread surface as would the Craven film for similar tire wear circumstances.

Accordingly, for the reasons set forth above, claim 28 is patentable over the cited reference combination. Further, claims 30-38, which depend directly or indirectly from claim 28, are also patentable for the same reasons as set forth above with respect to claim 28 and because of the further restrictions they add.

Accordingly, claims 28-38 are not obvious over the cited art and withdrawal of the Section 103 rejection is, therefore, respectfully requested.

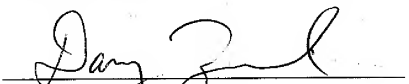
CONCLUSION

For the foregoing reasons, it is believed that all of the claims, as presently presented, are patentable.

The Examiner is invited to telephone the undersigned if it is believed that further amendment and/or discussion would help to advance the prosecution of the present application.

Reconsideration and allowance of claims 28-38 are, therefore, respectfully requested.

Respectfully submitted,



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Encls. (Tables A, B, C and FIG. A)